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मानक

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Mazdoor Kisan Shakti Sangathan

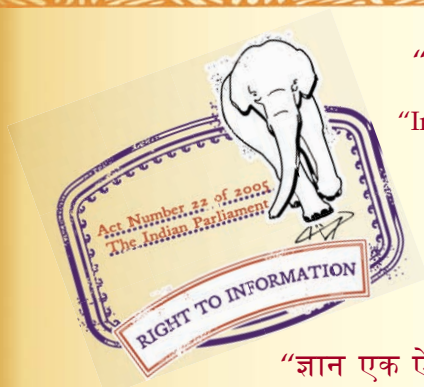
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Jawaharlal Nehru

“Step Out From the Old to the New”

IS/QC 160100 (1988): Electrical Relays Sectional Specification: Electromechanical All-or-Nothing Relays of Assessed Quality [ETD 35: Power Systems Relays]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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(Reaffirmed 1999)

Indian Standard
ELECTRICAL RELAYS
Sectional Specification :
Electromechanical All-or-Nothing
Relays of Assessed Quality

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

INDIAN STANDARD
ELECTRICAL RELAYS
Sectional Specification :
Electromechanical All-or-Nothing
Relays of Assessed Quality

National Foreword

This Indian Standard, which is identical with IEC Pub 255-19/QC 160100(1983) 'Electrical relays, Part 19 Sectional specification: Electromechanical all-or-nothing relays of assessed quality' issued by the International Electrotechnical Commission (IEC), was adopted by the Bureau of Indian Standards 7 September 1988 on the recommendation of Relays Sectional Committee, and approval of the Electrotechnical Division Council.

Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

Cross References

In this Indian Standard, the following International Standards are referred to. Read in their respective places the following:

<i>International Standard</i>	<i>Corresponding Indian Standard</i>
IEC QC 001001 : 1986 Basic rules of the IEC Quality assessment system for electronic component	IS QC 001001 : 1988 Basic rules of the IEC Quality assessment system for electronic component
IEC QC 001002 : 1986 Rules of procedure of the IEC Quality assessment system for electronic components (IECQ)	IS QC 001002 : 1988 Rules of procedure of the IEC Quality assessment system for electronic components (IECQ)
IEC Pub 255-7 (1978) Specification for electrical relays, Part 7: Test and measurement procedures for electromechanical all-or-nothing relays	IS QC 160000 (1) : 1988 Specification for electrical relays: Part 1 Test and measurement procedures for electromechanical all-or-nothing relays
IEC Pub 255-10 (1979) Specification for electrical relays, Part 10: Application of the IEC Quality assessment system for electronic components to all-or-nothing relays	IS QC 160000 (2) : 1988 Specification for electrical relays: Part 2 Application of the IEC Quality assessment system for electronic components to all-or-nothing relays

The technical committee responsible for the preparation of this standard has reviewed the provisions of the following IEC Publications and has decided that they are acceptable for use in conjunction with this standard:

IEC Pub 68-1 (1982) Basic environmental testing procedures, Part 1: General and guidance

IEC Pub 255-0-20 (1974) Electrical relays. Contact performance of Electrical relays

IEC Pub 255-1-00 (1975) All-or-nothing electrical relays

IEC Pub 255-5 (1977) Electrical relays, Part 5: Insulation tests for electrical relays

IEC Pub 410-1973 Sampling plans and procedures for inspection by attributes

IEC Pub 419-1973 Guide for the inclusion of lot-by-lot and periodic inspection procedures in specifications for electronic components (or parts)

ISO 2015 : 1976 Numbering of Weeks

This Indian Standard is intended primarily for use under the IECQ system. A regular Indian Standard for this component could be different, identical or similar to this standard.

Only the English language text given in the IEC Publication has been retained while adopting it as Indian Standard.

ELECTRICAL RELAYS

Sectional specification: Electromechanical all-or-nothing relays of assessed quality

SECTION ONE — GENERAL AND DEFINITIONS

1. General

1.1 *Scope and object*

This standard specifies the appropriate methods of test, selected from the generic specification IEC Publication 255-7, to be used in detail specifications for electromechanical all-or-nothing relays of assessed quality derived from this specification. It also gives the basic test schedules which are to be used in the preparation of such detail specifications.

The way in which detail specifications are to be written is indicated in the detailed test schedules contained in the separate blank detail specifications which supplement this specification.

1.2 *Related documents*

IEC Publication 68-1: Basic Environmental Testing Procedures, Part 1: General and Guidance.

IEC Publication 255-0-20: Electrical Relays, Contact Performance of Electrical Relays.

IEC Publication 255-1-00: All-or-nothing Electrical Relays.

IEC Publication 255-5: Electrical Relays, Part 5: Insulation Tests for Electrical Relays.

IEC Publication 255-7: Electrical Relays, Part 7: Test and Measurement Procedures for Electromechanical All-or-nothing Relays.

IEC Publication 255-10: Electrical Relays, Part 10: Application of the IEC Quality Assessment System for Electronic Components to All-or-nothing Relays.

IEC Publication 410: Sampling Plans and Procedures for Inspection by Attributes.

IEC Publication 419: Guide for the Inclusion of Lot-by-lot and Periodic Inspection Procedures in Specifications for Electronic Components (or Parts).

IEC Publication QC 001001: Basic Rules for the IEC Quality Assessment System for Electronic Components (IECQ).

IEC Publication QC 001002: Rules of Procedure for the IEC Quality Assessment System for Electronic Components (IECQ).

ISO Standard 2015: Numbering of Weeks.

2. Definitions

For the purpose of this standard, the following definitions shall apply:

2.1 *Primary stage of manufacture*

The primary stage of manufacture is the inspection carried out by the relay manufacturer on receipt of goods in order to check that they fulfil his specified requirements.

2.2 *Structurally similar relays*

Relays are considered structurally similar if having no other differences in design than:

- a) coil wire diameter and number of turns,
- b) types, numbers and material of contacts,
- c) rated coil and/or contact voltage(s),
- d) mounting and terminal variants.

All or any up to a limit prescribed in the detail specification.

SECTION TWO — QUALITY ASSESSMENT PROCEDURES

3. Diversity of detail specifications

One detail specification shall cover structurally similar relays only (see Sub-clause 2.2).

4. Qualification approval tests

Qualification approval tests shall include all the tests prescribed in the detail specification, and shall be performed:

- a) with short production runs: by a schedule specifically prescribed in the detail specification for this purpose;
- b) with large production runs: by the schedule given in the detail specification for quality conformance inspection on three consecutive lots.

As a general rule, a minimum of five specimens will be required for each group of tests in a test schedule according to Item a), while specimens having passed a non-destructive test may be used again for subsequent destructive tests.

5. Formation of inspection lots

Inspection lots shall be formed in accordance with the sampling plans and procedures given in IEC Publication 410, except for small production runs, isolated lots, and small lots.

- 5.1 When sampling is carried out in accordance with IEC Publication 410, the per cent defective concept only shall be used. Stratified or representative sampling should always be used to include all production lines and structurally similar relays in proportion to their respective quantities in the lot.

Where variants are liable to cause differing results for a particular test, exceptions from proportionality may become necessary and shall be stated in the detail specification or agreed between the manufacturer and the National Supervising Inspectorate (NSI). Relays should be as representative as possible of the production (for representative sampling, see IEC Publication 410, Sub-clause 7.2).

The sample size *fixed* in the detail specification for specimens intended for *periodic* group C tests, shall be taken from a lot or lots which already has or have passed successfully the tests of Groups A and B.

Group C may be divided into sub-groups according to the sampling interval. The specimens may be taken from a lot passing off the production line of the sub-group C period in consideration, and/or from lots accepted since the end of the last sub-group C period.

- 5.2 A short production run is defined as a production comprising not more than 30 inspection lots. For each of these lots the procedures for isolated lots should be adopted. However, depending on lot size and acceptable quality level (AQL), the sampling procedures will be more effective with large lots and low AQL, which may also be considered when determining the sampling plans to be used. These shall be agreed between the manufacturer and the NSI.

- 5.3 An isolated (as distinct from the lot of isolated nature in IEC Publication 410, Sub-clause 11.6) is defined as a unique production or supply lot not forming part of a current sequence of lots for inspection under the Quality Assessment System.

The following options are available and shall be chosen upon agreement between the manufacturer and the NSI:

- a) 100% inspection if the lot is too small for sampling with adequate discrimination against the acceptance of relays not conforming to the specified AQL and inspection level (IL) (non-destructive tests only).
- b) Change to a sampling plan with an operating characteristic giving adequate protection (DR)* at the limiting quality (LQ) and for the known usage of the relays in the lot. The plan to be used shall be agreed between the manufacturer and the NSI and should not unduly increase the manufacturer's risk at the original AQL. The plan chosen may have both different AQL and IL from those specified in the detail specification.

Note. — * DR = discrimination ratio, defined as:

$$\frac{\text{limiting quality level at which acceptance probability is 10\%}}{\text{AQL}}$$

(see Tables VI-A and X of IEC Publication 410)

- c) Where good discrimination cannot be obtained, for example for a small lot and a destructive test, a greater sampling risk shall be taken and agreement on the plan to be used shall be reached between the manufacturer, the NSI and when known, the ultimate purchaser (user of the relays).

- 5.4 For small lots, procedures as described in Items *a)*, *b)* or *c)* of Sub-clause 5.3 may be used and agreed between the manufacturer, the NSI and when known, the ultimate customer (user of the relays).

6. Test schedules

- 6.1 A test sequence shall consist of all tests listed in the detail specification. All the values listed in a detail specification shall be checked or tested.

The reference numbers of the tests are those of IEC Publication 255-7, which constitutes a generic specification for electromechanical all-or-nothing relays, except those described in detail in the detail specification.

- 6.2 The IL-notation applies for all tests in one sub-group. For the AQL-notation, ranges are given including a notation of the centre value as underlined, and the authority preparing detail specifications shall choose the appropriate value which then applies to all tests in one sub-group.
- 6.3 All tests in sub-group A0 shall normally be performed on every relay. However, if for some reason there is a need to check by auditing that the 100% tests are properly done, or in the special cases of continuous production, it is advised to check the lot on a statistical basis. For this purpose, an IL value and an AQL range are given in Table I (100% testing does not guarantee the complete absence of defectives).
- 6.4 Any IL- and AQL-notations shall be interpreted in such a way that the number of defectives allowable for acceptance is applicable to each test within a sub-group separately.

Nevertheless, it is accepted that accumulated AQL are used in detail specifications when so decided between manufacturer and user.

7. Order of tests

- 7.1 Quality conformance inspection is divided into two parts: that carried out lot-by-lot, on which the release of the individual lots is based, and that carried out on a periodic basis which contains the time-consuming and more expensive tests.

Groups A and B contain lot-by-lot tests whereas periodic and further tests required for the maintenance of qualification approval are contained in group C.

- 7.2 When several tests are to be carried out consecutively on one and the same specimen or number of specimens, the following order shall apply, unless otherwise prescribed in the detail specification.
- a)* Tests of sub-group A0 shall always precede any other non-destructive (ND) or destructive (D) tests.
 - b)* Tests in groups other than A0 shall be performed in the sequence given in the Blank Detail Specification. It should be ensured that the effects of earlier tests are not liable to invalidate the results of the later tests.

8. Certified test records

Certified test records are to be given as described in IEC Publications QC 001001 and QC 001002, and shall contain the relevant information prescribed in the detail specification.

SECTION THREE — WRITING OF BLANK DETAIL AND DETAIL SPECIFICATIONS

9. Blank detail specifications

Blank detail specifications shall follow the test schedules and the related explanations given in Table I of this specification and the related explanations.

Detail specifications shall follow the blank detail specifications as far as tests in the latter are marked by M (mandatory). Tests marked by R (recommended) may be included in the detail specifications. Other tests contained in IEC Publication 255-7 and any other tests not listed there but deemed necessary, may be included but care shall then be taken to check whether the IL- and AQL notations are still reasonable, and that the final measurements for each test in a group are correctly listed at the end of that group.

Note. — Although some tests are marked by R in the blank detail specification, which makes them recommended, any such test will be mandatory if included in the detail specification.

10. Detail specifications

10.1 Detail specifications shall give the following information, taking account of the explanations given below and the blank detail specification shall have spaces for this purpose.

a) Identification of the detail specification

Identification shall be provided by the IEC number and the date of issue.

b) Identification of the relay and information on its application

Identification shall be provided by properties such as: size, sealing, whether monostable or bistable, polarized or not, etc.

c) Outline drawing of the relay with the key dimensions

This shall be an illustration of the relay as an aid to easy recognition and for comparison with other relays. Reference to mounting variants shall be included. Code names and symbols shall, where applicable, be in accordance with IEC Publication 255-10.

Those dimensions affecting interchangeability shall be separately tabulated.

The installation details including methods of mounting of the relay and any restrictions shall be stated. The designation of the connections shall be given as appropriate together with minimum values for clearances and creepage distances as given in Table IV of IEC Publication 255-5.

- d) Reference data of the relay (not for inspection purposes)
The following ratings and performance characteristics shall be given where applicable.

The preferred rated values shall be those specified in IEC Publications 255-1-00, 255-0-20 and 255-5.

1) Rated values

The following ratings and test values shall be given:

1.1) Coil(s)

- i) rated voltage and/or current at reference temperature*
- ii) rated range, voltage and/or current at reference temperature*
- iii) resistance or impedance and tolerance at reference temperature*
- iv) insulation resistance and measurement voltage
- v) dielectric test voltage(s)
- vi) frequency (for a.c. relays)
- vii) special operating conditions (if any)

1.2) Contact(s) (resistive load, unless otherwise specified)

- i) number and description of contact units
- ii) minimum and maximum contact voltages
- iii) minimum and maximum contact currents
- iv) maximum rated load at which ii) and/or iii) apply in watts for d.c. relays and volt-amperes for a.c. relays
- v) insulation resistance and measurement voltage
- vi) dielectric test voltage(s)
- vii) special operating circuit conditions (if any)

1.3) Limiting conditions of use (not for inspection purposes)

- i) climatic category
- ii) temperature range
- iii) shock
- iv) bump
- v) acceleration
- vi) vibration
- vii) low air pressure
- viii) mass
- ix) any other limitations

Note. — Standard methods of expressing the above parameters are given in IEC Publication 68-1.

2) Performance characteristics

The following performance characteristics at reference temperature* shall be given:

- i) performance values and limits as required
- ii) contact circuit resistance and points of measurement
- iii) contact bounce time
- iv) operate and release times
- v) minimum number of cycles at stated loads or currents*
- vi) permitted number of false contact cycles during electrical endurance (other than low level)

Other characteristics may be included, giving values and the conditions under which they apply.

* Temperature defined in the detail specification.

e) Related documents

Reference shall be made to IEC Publications 255-7 and 255-10 and this sectional specification. When reference to further publications is necessary, such publications shall be listed with their full title, year of edition and, unless common knowledge, the source from where they may be obtained.

f) Level of assessment

Table I of this specification contains three test schedules. They shall be referenced as test schedule X (number 1, 2 or 3) without additions, if containing only tests listed in that schedule, or as test schedule X with additions, if tests have been added which are not listed in the test schedule.

g) Intervals between tests of group C and specified sample size.

h) Formation of inspection lots, if predictable in the sense of Clause 5.

i) Order of tests, if deviating from Clause 7.

j) General test conditions, if deviating from Clause 16 of IEC Publication 255-7.

k) Qualification approval test schedule.

l) Quality conformance test schedule.

For *k)* and *l)*: for each sub-group of tests, the final measurements specified in each of them shall be summarized and be stated at the end of the sub-group.

m) Specification of IL-numbers.

n) Specification of AQL-numbers.

o) Marking of package and/or relays beyond that listed in this specification, if necessary.

Each of these features shall be considered during tests of the relays covered by the detail specification.

10.2 Additional information, such as diagrams, graphs, application data and notes may be given in an appendix of the detail specification. This is not to be used for test purposes.

10.3 When preparing detail specifications the following steps are to be taken in order to obtain an adequate test schedule.

a) Select from Table I of this sectional specification the properties relevant to the intended use of the relay.

b) Select the test schedule which most closely satisfies the requirements for the relay.

TABLE I

Basic test schedules for electromechanical all-or-nothing relays

Explanations and abbreviations

Ranking of test schedules

All mandatory and recommended tests listed in test schedule 1 are also included in test schedule 2, plus some further tests. Likewise the tests of test schedule 2 are again included in test schedule 3, plus still further tests. In a few cases, tests are shifted from one group to another, or recommended tests become mandatory when proceeding from test schedule 1 to the higher ones.

Such shifting and changes are marked by an asterisk (for example, M*).

Order of tests

The tests in each sub-group are listed in the order of the numbering of clauses in IEC Publication 255-7. For the order in which tests shall be carried out, see Clause 7 of this standard.

Abbreviations

Options

M = mandatory test to be included in detail specification

R = recommended test for inclusion in detail specification

Tests contained in IEC Publication 255-7 but not listed in the test schedule may be added to any detail specification if required.

Properties of relays as given in Table I of IEC Publication 255-10

RT 0 = relay with non-sealed contacts

RT I = relay with sealed contacts

RT II = sealed relay.

Categories of contacts

CA 0 = relay with category 0 contacts (30 mV; 10 mA)

CA I = relay with category 1 contacts (60 V; 100 mA)

CA II = relay with category 2 contacts (250 V; 1 A)

CA III = relay with category 3 contacts (600 V; 100 A)

The application categories of contacts are defined in full in Clause 9 of IEC Publication 255-7.

Explanatory notes

The following Table I refers to the following notes:

1. — These tests are to be carried out in this test group when either or both of the following situations apply:
 - (I) When the parameter concerned is vital to the successful operation of the relay in its intended use.
 - (II) When the manufacturing variability is comparable to the specified tolerance range for a stated parameter, and when any relay with characteristics outside these limits would have an adverse effect in its intended use.
2. — Only applicable when agreed upon between manufacturer and purchaser and when the test duration does not exceed one week.
3. — Only applicable when agreed upon between manufacturer and purchaser.
4. — Combination of electrical and mechanical endurance tests is allowed when the required number of operations for one of the electrical endurance tests is at least equal to the number of operations required for mechanical endurance.

TABLE I

Clause of Publication 255-7	Test	Test schedule 1	Test schedule 2	Test schedule 3
Group A Sub-group A0 For all tests in this sub-group <i>General case:</i> 100% test <i>Special case:</i> IL: II AQL: 0.065 ... 0.25 ... 0.65				
17.4	Visual inspection, marking	M	M	M
20	Dielectric test	M selected terminals as per detail specification	M selected terminals as per detail specification to which Note 1 applies	M selected terminals as per detail specification to which Note 1 applies
24	Functional tests	M operate and release value for RT I and RT II only	M operate and release value for RT I and RT II only	M operate and release value for RT I and RT II only
31.2	Sealing	M for RT II only	M for RT II only	M for RT II only
23	Contact-circuit resistance		M for CA 0 only	M for CA 0 only
19.1	D.C. coil resistance			M* if Notes 1 and/or 3 apply
Sub-group A1 For all tests in this sub-group IL: I AQL: 0.4 ... 1.0 ... 4				
19.1	D.C. coil resistance	M for d.c. relays only	M for d.c. relays only	M only if not tested in A0
19.3	Coil impedance	M for a.c. relays only	M for a.c. relays only	M for a.c. relays only
24	Functional tests	M operate and release value for RT 0 only	M operate and release value for RT 0 only	M operate and release value for RT 0 only
18.1	Mechanical test procedures		R	R
23	Contact-circuit resistance		M for CA I only	M for CA I only
32	Internal moisture		R* only for relays combining both RT II and CA 0	M* only for relays combining both RT II and CA 0

(Table continued)

TABLE I (continued)

Clause of Publication 255-7	Test	Test schedule 1	Test schedule 2	Test schedule 3
25	Timing tests			R* If Notes 1 and/or 3 apply
Sub-group A2 For all tests in this sub-group IL: S 4 AQL: 0.4 ... 1.0 ... 4				
17.1	Check of dimensions	R	M*	M
Sub-group A3 For all tests in this sub-group IL: II AQL: 0.4 ... 1.0 ... 4				
17.4	Visual inspection, other than marking	M	M	M
Sub-group A4 For all tests in this sub-group IL: S 4 AQL: 0.4 ... 1.0 ... 4				
20	Dielectric test		M* further selected terminals not tested in A0 and if Note 1 applies	M further selected terminals not tested in A0 and if Note 1 applies
22	Insulation resistance			M*
Group B Sub-group B1 For all tests in this sub-group IL: S 3 AQL: 0.4 ... 1.5 ... 6.5				
41	Electrical endurance		R* only if Notes 1 and 2 apply	R only if Notes 1 and 2 apply
Sub-group B2 For all tests in this sub-group IL: S 3 AQL: 0.4 ... 1.0 ... 4				
30	Rapid change of temperature, Method 2		M for RT II only	M for RT II only
35	Robustness of terminals		M* for RT II only	M for RT II only
32	Internal moisture	R only for relays combining RT II and CA 0		

(Table continued)

TABLE I (continued)

Clause of Publication 255-7	Test	Test schedule 1	Test schedule 2	Test schedule 3
Sub-group B2 (continued)				
29	Temperature rise		R	R
36	Solderability, Test 1	M for printed wiring boards relays only	M	M
54	Magnetic remanence		R for d.c. relays only	R for d.c. relays only
Sub-group B3 For all tests in this sub-group IL: S 3 AQL: 0.1 ... 0.65 ... 2.5				
53	Contact sticking		R for RT I and RT II only	R for RT I and RT II only
Group C IL and AQL are given here as a guide only. Instead of IL and AQL values, the detail specification may indicate for each sub-group: 1. Number of relays to be tested 2. Number of defectives allowed The detail specification shall state the periodicity of tests according to IEC Publication 255-10. Sub-group C1 For all tests in this sub-group IL: S 2 AQL: 0.4 ... 1.5 ... 6.5				
41	Electrical endurance		R* only if Note 1 applies, and if not tested in B1	R only if Note 1 applies, and if not tested in B1
Sub-group C2 For all tests in this sub-group IL: S 3 AQL: 0.4 ... 1.0 ... 4				
20	Dielectric test	M terminals not tested in A0	M terminals not tested in A0 and A4	M terminals not tested in A0 and A4
22	Insulation resistance		M	
23	Contact-circuit resistance		R for CA II and CA III only	M* for CA II and CA III only
25	Timing tests		R	M* only if not in A1
19.2	Coil inductance			R

(Table continued)

TABLE I (continued)

Clause of Publication 255-7	Test	Test schedule 1	Test schedule 2	Test schedule 3
<i>Sub-group C3</i> For all tests in this sub-group IL: S 2 AQL: 0.4 ... 1.5 ... 6.5				
17.1	Check of dimensions	R dimensions only if not checked in A2		
18.2	Weighing		R	R
50	Electrical contact noise			R for CA 0 and CA I only
<i>Sub-group C4</i> For all tests in this sub-group IL: S 2 AQL: 0.4 ... 1.5 ... 6.5				
41	Electrical endurance	R	M* only if not tested in B1 or C1	M only if not tested in B1 or C1
42	Mechanical endurance		M see Note 4	M see Note 4
<i>Sub-group C5</i> For all tests in this sub-group IL: S 2 AQL: 0.4 ... 1.0 ... 4				
26	Climatic sequence	R	R	R
27	Damp heat, steady-state	R	R	R
33.1	Salt mist		R for RT II only	R for RT II only
35	Robustness of terminals	R	M* only if not tested in B2	M only if not tested in B2
37 38 39 40	Shock Bump Vibration Acceleration }	R	R	R
43	Thermal endurance			R
51	Thermoelectric e.m.f.			R for CA 0 only
<i>Sub-group C6</i> For all tests in this sub-group IL: S 2 AQL: 1.5 ... 2.5 ... 6.5				
28	Thermal resistance		R	R

(Table continued)

TABLE I (continued)

Clause of Publication 255-7	Test	Test schedule 1	Test schedule 2	Test schedule 3
<i>Sub-group C6 (continued)</i>				
30	Rapid change of temperature		R for RT 0 and RT I only	R for RT 0 and RT I only
36	Resistance for soldering heat, Test 2		R	R
34	Mould growth			R

SECTION FOUR — MARKING

11. Marking

Relays and their package supplied in accordance with detail specifications covered by this specification, shall be marked as follows unless otherwise prescribed in the detail specification.

11.1 Relay (minimum information)

- trade mark or manufacturer's name
- relay type code
- coded date of manufacture to at least the nearest month in accordance with ISO 2015 if appropriate.

11.2 Packages (minimum information)

- detail specification reference
- trade mark or manufacturer's name
- relay type code
- manufacturer's batch identification code
- quantity.

APPENDIX A

EXPLANATIONS AND EXAMPLES REGARDING INSPECTION LEVEL (IL) AND ACCEPTABLE QUALITY LEVEL (AQL) VALUES

A1. Introduction

This sectional specification, and the blank detail and detail specifications derived from it, generally use the concept of IEC Publication 410 which is based on notations called IL- and AQL-values.

This appendix explains in a rather simple form the meaning of inspection level (IL) and acceptable quality level (AQL) while showing by some examples the consequences of choosing IL- and AQL-values.

It is not intended to replace or supersede the far more detailed terminology and specifications contained in IEC Publication 410.

A2. Inspection level — IL

The inspection level determines the relationship between the lot or batch size and the sample size. This relationship is established by means of a table in IEC Publication 410 which contains lines for various lot or batch sizes, from 2 to more than 50 000, and contains columns for seven different inspection levels. These levels are divided into two groups:

- the general inspection levels are I, II and III from which IL II will normally be used, while IL I results in a smaller, and IL III in a larger number of test specimens;
- the special inspection levels are S-1 to S-4 and result in far smaller sample sizes. They are to be used for expensive tests, for example destructive tests or tests of long duration. IL S-1 results in the smallest, and IL S-4 results in the largest sample size among the special inspection levels.

A3. Sample sizes versus IL-values

If single sampling and normal inspection (see IEC Publication 410 for the explanations of these terms) are used, the following examples of relationship between lot or batch size and sample size apply.

Lot or batch size	Sample size for IL						
	S-1	S-2	S-3	S-4	I	II	III
91 to 150	3	3	5	8	8	20	32
501 to 1 200	5	5	13	20	32	80	125
10 001 to 35 000	5	8	20	50	125	315	500

A4. Acceptable quality level — AQL

The acceptable quality level is — simply explained — the percentage of defectives within a lot which a purchaser is willing to tolerate, and which is ensured to him, by means of sampling inspection, at a given probability. This probability is of the order of 90% but varies with the chosen IL and AQL.

The AQL is the index of tables in IEC Publication 410 which relate Ac (accepted) and the sample size.

Ac is the maximum number of defectives up to which the lot or batch is accepted. The figure Ac results from statistical equations (Poisson distributions) which connect IL and AQL notations such that the supplier, when complying with these figures, may suppose at the given probability, that the purchaser will accept the delivery when the latter uses the same AQL.

A5. Admitted defectives versus AQL

If single sampling, normal inspection and IL II are used, the following examples of relationship between sample size and number of allowed defectives apply.

It is to be noted that some AQL-values may require a larger or smaller sample size than determined in accordance with the IL-value. These sample size values are in bold type in the following table.

Refer to document IEC Publication 410 for further information.

Lot size	AQL at IL II											
	0.25		0.40		0.65		1.0		1.5		2.5	
	S	Ac	S	Ac	S	Ac	S	Ac	S	Ac	S	Ac
91 to 150	50	0	32	0	20	0	13	0	32	1	20	1
501 to 1 200	50	0	125	0	80	1	80	2	80	3	80	5
10 001 to 35 000	315	2	315	3	315	5	315	7	315	10	315	14

S = sample size
Ac = number of allowed defectives